RESEARCH ARTICLE

EFFECTS OF STRETCHING EXERCISES WITH OR WITHOUT BACLOFEN ON SPASTICITY, FLUID INTAKE AND CALORIES INTAKE IN CEREBRAL PALSY CHILDREN

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ABSTRACT

Objectives: to find out the effectiveness of stretching exercises and baclofen alone and combined in spastic cerebral palsy children on spasticity, fluid and calorie intake. **Material & Methods:** A single-blinded, randomized control trial was conducted at Allama Iqbal Hospital, and Idrees Teaching Hospital. The n=60 participants between 5-12 years, having spasticity score of 2 or more on Modified Ashworth Scale (MAS). The participants were randomly divided into three treatment groups receiving Baclofen, sustained stretching exercises and combination baclofen and sustained stretching exercises. Data were collected at baseline and after six weeks as fluid and calorie intake, and spasticity on Modified Ashworth Scale (MAS). **Results:** The result showed significant difference ($p<0.05$) among group with large effect size while comparing mean differences of Fluid intake {$F(df)=2,57(988.603)$, $\eta^2=0.972$, $p<0.001$} and Calories intake {$F(df)= 2,57(166.877)$, $\eta^2=0.854$, $p<0.001$}. While there was no significant difference in mean difference of spasticity {$F(df)= 2,57(2.119)$, $p=0.130$}. **Conclusion:** baclofen along with stretching exercises significantly improved fluid, calorie intake and spasticity

Keywords: Calories, cerebral palsy, spasticity, stretching exercises

INTRODUCTION

Cerebral Palsy is a group of permanent disorders of development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal and infant. The motor impairments of CP is often followed by disturbances of perception, cognition, behaviour, communication, epilepsy, sensation, and musculoskeletal problems.[1] The worldwide prevalence of CP is 2.5 per 1000, but it may differ from 1-6 per 1000 births. As every 2 to 3 children out of 1000 have CP, which makes it the most common neurodevelopmental motor disability in children.[2]

The most common type of CP is spastic which comprises 80% of total cases reported.[3] The upper motor neuron lesion causes spasticity, hyperreflexia, and extensor plantar response. Also, spastic cerebral palsy patients have mass, slow and effortful movements instead of fine movements.[4] Spastic CP patient usually presents with muscle imbalance, stand with bent knees and legs tightly closed together i.e. scissors-type gait. The patient usually has typical pattern of muscle weakness, sensory and motor control impairment,[1] which affects the activities of daily living of children.[5] In spastic CP patient malnutrition and growth failure is common condition and mainly occurs due to reduced fluid and calorie intake, excessive loss of nutrients and abnormal energy metabolism.[6]

The management of CP requires multidisciplinary team approach to address medical, psychological, social, intellectual, and educational issues to gain functional independence and improves performance in activities of daily living. In many previous studies different treatment approaches such as pharmacological, non-pharmacological and surgical were being used for the management of CP patient.[4] Physical therapy, occupational therapy and electrical stimulation is an integral part of CP management,[7] however oral anti-spasticity drugs such as benzodiazepines, baclofen, and tizanidine are also used to reduce general spasticity.[8,9]

A previous literature showed significant improvement in spasticity after stretching exercises in spastic cerebral palsy children.[10] Also, intrathecal baclofen is also effective in reducing spasticity by acting on receptors in brain and spinal cord to reduce abnormal tone.[11,12] However studies have been conducted previously but as far as authors' knowledge based on literature review, no published data was found on effectiveness of baclofen along with stretching exercise on fluid, calorie intake and spasticity. The aim of the study was to find out the effectiveness of stretching

exercises and baclofen alone and combined in spastic cerebral palsy children on spasticity, fluid and calorie intake.

METHODOLOGY

A single-blinded, randomized control trial was conducted at Allama Iqbal Hospital, and Idrees Teaching Hospital, Sailkot having good patient turn over and timely follow up of patients over a time period of six months. The study was initiated after taking approval from authorities. Informed consent was obtained from all patients which was in accordance to the deceleration of Helsinki.

The participants with the age group of 5-12 years, and who had a score of 2 or more on Modified Ashworth Scale (MAS) were included in the study, While participants were excluded who had other type of CP with additional systemic comorbidities were excluded. Initially, n=196 patients were evaluated for the eligibility and n=136 were excluded. Therefore, n=60 patients fulfilled the inclusion criteria and showed willingness to participate in the study, were randomly divided into Baclofen, Sustained stretching exercises and combination of Baclofen and sustained stretching exercises group (Figure 1). The patients were recruited through non-probability consecutive sampling technique. The simple random sampling through toss & trial method was used for allocation of participants into three groups.

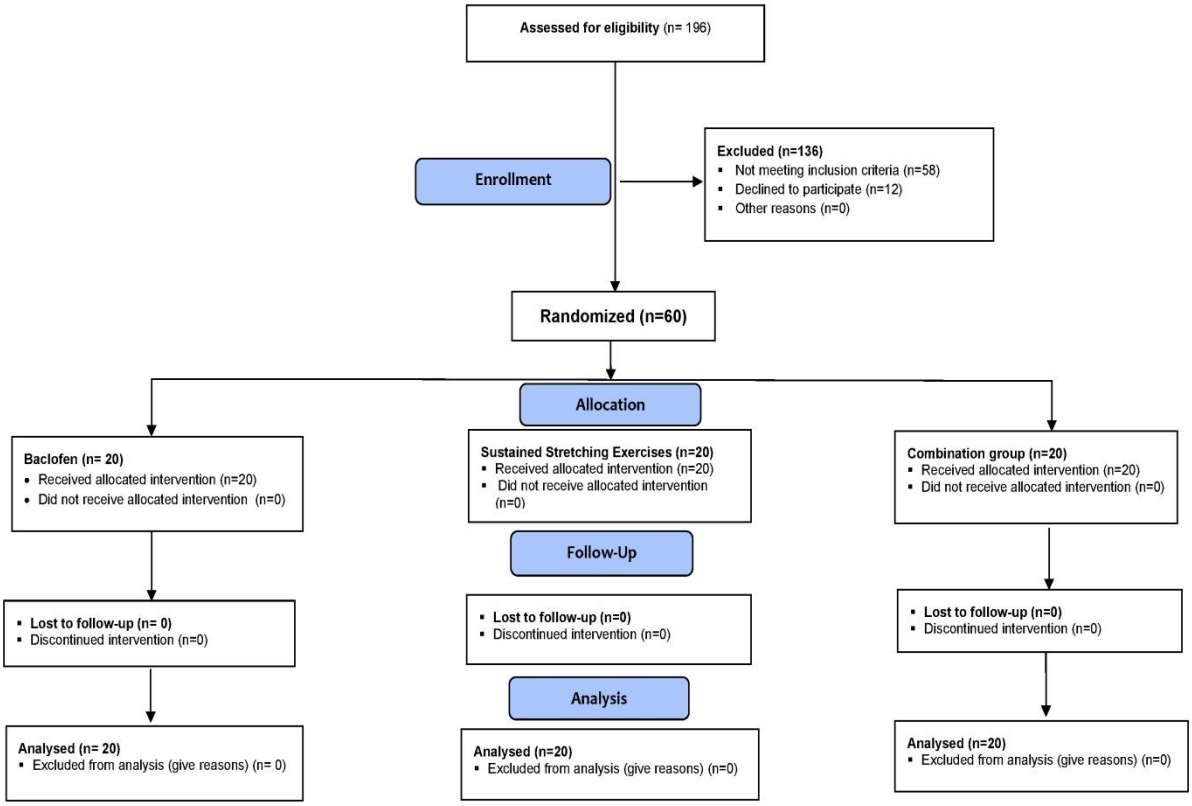

Figure 1: CONSRT diagram

The baclofen group received 5 mg of baclofen each six to eight hourly. The maximum dosage was increased until the point when side effects occurred. The successful dosage ranged from 15 mg to 160 mg for every day or more. Baclofen was presented over a multi week titration period and after that kept up at the most astounding endured dosage for three weeks. The treatment stage was isolated by a multi week tranquilize withdrawal and a fourteen day washout period. The baclofen was administered by a clinician.

In sustained stretching exercises group stretching of upper and lower limb major muscle groups was carried by asking the patient to hold for 30 seconds, rest, and repeat 3-5 times. Stretching was done on alternate days, one session per day, for six weeks. The third group received combination of baclofen and sustained stretching with same dosage as given to both groups individual. The participants of each group were followed up for 6 weeks.

Data were collected by Performa / Questionnaire, which calculated basic demographics, BMI, fluid and calorie intake, and Modified Ashworth Scale (MAS). MAS was used to measure spasticity.[13] The One Way ANOVA was applied on mean difference (MD) of pre-post score after six week's intervention. Statistical significance was set at $p<0.05$ and eta square ($\eta^{2)}$ was used for effect size. SPSS Version 21 was used to analyze the data.

RESULTS

The mean age of the study participants was 10.57±2.902 year. Regarding gender distribution n= 33 were females and n=27 were males participated in the study. Of the total participants, n=18 had normal weight, n=9 were obese and the remaining n=33 were overweight.

The result showed significant difference ($p<0.05$) among group with large effect size while comparing mean differences of Fluid intake {F(df)=2,57(988.603), η^2 =0.972, $p<0.001$} and Calories intake {F(df)= 2,57(166.877), η^2 =0.854, $p<0.001$}. While there was no significant difference in mean difference of spasticity {F(df)= 2,57(2.119), p=0.130,}.

The post hoc analysis showed that the fluid intake were significantly improved in group receiving stretching and baclofen both as compared to baclofen alone (MD=357, d=2.18, 95% CI=-381.8159 to -332.1841) and stretching alone (MD=317, d=1.94, 95% CI=291.8039 to 342.1961). The calories intake also showed significant improvement same as fluid intake in group receiving stretching and baclofen both as compared to baclofen alone (MD=180.75, d=2.13, 95% CI=-205.7496 to -155.7504) and stretching alone (MD=140.50, d=1.66, 95% CI=115.5004 to 165.4996). While comparing the groups regarding spasticity, no statistical significant difference (*p≥0.05*) was observed among the groups as shown in table 1.

Table 1: between Group Analysis

	Baclofen		Stretching		Stretching With Baclofen		F(df)	Sig	η^2
	Mean	SD	Mean	SD	Mean	SD			
Fluid Intake (ml)	-306.5	16.23	-346.5	18.43	-663.5	41.45	988.60(2,57)	.000	.97
Calories Intake (kcal)	-327	32.78	-367.25	22.91	-507.75	40.47	166.87(2,57)	.000	.85
Spasticity (MAS)	0.35	0.48	-0.4	0.50	0.65	0.48	2.119(2,57)	.130	.069

Significance level: <0.05, <0.01**& <0.001****

DISCUSSION

The aim of the study was to determine the effectiveness of baclofen and stretching exercises on fluid and calorie intake, and spasticity in spastic cerebral palsy children. According to the results of the current study, combination of baclofen and stretching exercises significantly improved fluid, calorie intake after 6 weeks of intervention.

The results of this study is also in coherence with the previous literature in which intrathecal baclofen (ITB) improved the weight gain and nutritional status i.e. fluid and caloric intake in spastic/hypertonic CP children. And improved nutritional status leads to good overall general health and decreases the risk of infections, illness and mortality rate in spastic CP population.[14] Furthermore, spasticity measured on MAS was also improved in all groups, supports by the previous study; in which baclofen reduce spasticity in upper and lower limb by acting at the level of spinal cord to obstruct the neurotransmitters that cause spasticity.[15]

A previous study by Kraus T et al in which It had been found that intrathecal baclofen not only decreased spasticity but also improved quality of life and satisfaction level of parents and children.[16] The spasm and pain relief, ease of care, improved sleep and independence of patients were also clinically improved after intrathecal baclofen.[17] It might be a reason of improved fluid and calorie intake, because loss of appetite compromised oral and general health are consequences of pain.[18]

Moreover, the results of recent study showed significant improvement in spasticity, fluid and calorie intake after 6 weeks of stretching exercises of both upper and lower limb which also relates with the previous findings.[19] In previous literature it has been discussed that increased spasticity leads to poor nutrition i.e. fluid and calorie

intake.[20] Slow and continuous stretching exercises are effective for reducing spasticity and it reduced spasticity might be a reason of improved nutritional status.[21] The possible reasons of decreased fluid and calorie intake are constipation, oral motor disorders, gastroesophageal reflux,[22] physical factors i.e. immobility and psychosocial factors i.e. pain, social isolation and depression. [23] It has been discussed in previous study that decrease lower extremity and trunk movement leads to constipation, however, stretching exercises of upper and lower extremity significantly reduce constipation in spastic CP, which may contribute to improve fluid and calorie intake.[24] Also, stretching exercises reduces the risk of contractures and improve mobility and flexibility to some extent and therefore improves performance in activities of daily living. [25,26]

Additionally, the results of the study showed more significant improvement in group receiving both therapies, baclofen and stretching exercises. As per authors' knowledge, so far no study has been published to determine the effectiveness of baclofen along with stretching exercises on fluid, calorie intake and spasticity in spastic cerebral palsy children.

CONCLUSION

It has been concluded that baclofen and stretching exercises alone significantly improved fluid, calorie intake and spasticity. However, baclofen along with stretching exercises showed more significant improvement.

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